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ABSTRACT

"Subtractive" bilingualism in Northern Belize is analyzed based on an extension of a model by Wallace Lambert. The impact of English language instruction on Spanish speaking children in Corozal Town, the northernmost urban center in the British colony of Belize, Central America, is described. This description extends an earlier account of education and bilingualism there (Rubinstein, 1979) and seeks to make explicit the links between social and cognitive processes in the development of Spanish-English bilingualism in Corozal Town. Lambert's distinction between additive and subtractive bilingualism is considered, and an attempt is made to distinguish between different types of subtractive bilingualism, the processes that underlie them, and the environmental conditions in which each may occur. A random sample of 56 Spanish speaking children between the ages of 5 and 17 was divided into two groups stratified by age and sex. One group was tested and interviewed in Spanish, and the other was tested and interviewed in English. It is concluded that the learning of English by Spanish speaking children in Corozal Town is socially subtractive because of the milieu in which it occurs: English is often taught with the intention that it replace students' first language (not that it supplements it), and this view is shared by many adults and children. The cognitive enhancement view of bilingualism does not recognize that the social setting of the bilingual experience may have cognitive consequences. (SW)

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"Subtractive" Bilingualism in Northern Belize

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"Subtractive" Bilingualism in Northern Belize

Interest in the consequences of the bilingual experience has been long standing in Anthropology and Psychology. In contrast to earlier work in the field (e.g., Jones and Stewart 1951), recent research presents the view that bilingualism provides the individual with a clear cognitive advantage over the monolingual. During the past two decades this view, first presented in its present form by Wallace Lambert (see, Lambert 1974, Peal and Lambert 1962), has been supported by numerous studies (e.g., Torrance et al. 1970, Balkan 1971, Ben Zeev 1972, 1975, 1977, Ianco-Worrall 1972, Lambert and Tucker 1972, and Lambert and Anisfeld 1969).

The advantage which bilingualism is thought to afford the individual is characterized as an increase in "cognitive flexibility," "creativity," or "divergent intelligence" (Lambert 1977, 1974). Although it is not entirely clear in the literature how this advantage develops, four processes— two linguistic and two non-linguistic— are offered as tentative explanations. The non-linguistic processes include the notions that (1) bilingualism improves memory by enhancing the storage of information, and (2) that the need to hold separate two complex linguistic systems serves as an aid in the development of general conceptual thought. The linguistic processes implicated essentially focus on the development of "metalinguistic awareness" and include the notions that the bilingual experience makes inescapable for the individual the fact (3) that there is a separation between linguistic symbols and their referents, and (4) that word meanings may be separated from word sounds.

Despite the lack of specificity in this "cognitive enhancement" view regarding which, if any, of these processes underlie the observed benefits of bilingualism, it has become a widely influencial view in psychology and education (e.g., Hornby 1977, Riegelhaupt 1979). While now taking it almost as a given that bilingualism is cognitively beneficial researchers working in this tradition have begun to move their research programs to an examination of the psychosocial effects of bilingualism by looking at the impact of ethnolinguistic systems on the folk assessment of personality types.

A principal tool in this research has been the "matched guise" task. Typically this involves the presentation to an individual of tape recodings of a standard passage being read by a group of balanced bilinguals in the listener's first and second languages. Upon hearing each reading of the passage, the listener is asked to assess the reader's personality by scoring him or her on a series of scales (e.g., friendly—unfriendly). Lambert (1974) reports that such assessments are heavily influenced by sociolinguistic factors about the particular language spoken by a reader.

In order to account for the variation that these sociolinguistic influences introduce into an account of the consequences of bilingualism, Lambert has distinguished between additive and subtractive bilingualism. Although the distinction is not fully developed (see Lambert 1974, 1977), he suggests that additive bilingualism occurs when a second language of social value is learned in addition to one's first language, and that subtractive bilingualism occurs when a second language is learned in a social setting in which it replaces the first language.

It is important to note that when considering the consequences of bilingualism the distinction between additive and subtractive forms is presented as working on the social rather than cognitive level. Thus as

the model is now formulated, bilingualism is viewed as cognitively enriching and either socially additive or socially subtractive.

This view maintains a curious and, I think, unfortunate division between these levels of analysis. Since a full understanding of human cognition and behavior requires studies which unify levels of organization (Rubinstein and Laughlin 1977:462), a complete view of the consequences of the bilingual experience must link social process and cognitive process in a meaningful fashion (Rubinstein 1979:596-597). The aim of this paper is to extend Lambert's model in a way which begins to establish this link.

To accomplish this I describe below the impact of English language instruction on Spanish speaking children in Corozal Town, the northernmost urban center in the small British colony of Belize, Central America (see Map 1). This description extends an earlier account of education and bilingualism there (Rubinstein 1979), and seeks to make explicit the links between social and cognitive processes in the development of Spanish-English bilingualism in Corozal Town. Following this I return to a

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Map 1 about here

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consideration of Lambert's distinction between additive and subtractive bilingualism. I attempt to distinguish between different types of subtractive bilingualism, the processes which underlie them, and the environmental conditions in which each may occur. Before continuing it is important to repeat that my intention is not simply to critique Lambert's view but to build upon it and to extend its range of useful application. I hope that my retention of his terminology serves to emphasize this.

English Instruction in Belize

Despite the fact that it is the first language of few Belizeans, standard English is the prescribed instructional language in schools throughout Belize.[1] This remains true despite much recent concern about the consequences of such a policy (e.g., Buhler and Hadel 1973, 1975, Young 1973). The implications of the continued use of English as the basic instructional medium for schools have been explored over the past few years by both Belizeans and non-Belizeans. Those discussions have tended to fall into two general groups; those expressing concern about the implications of this practice for social (or ethnic) groups, and those focusing on the effects of this practice on the students' own development.

Because in many parts of Belize language usage is a symbolic marker of ethnic group membership (e.g., Le Page 1972, Koenig 1975, Brockman 1977) several writers have suggested that on the social level the use of English in Belizean schools— as though it were everyone's first language— poses a threat to the development of children's sense of identification with other members of their ethnic group (see, e.g., various articles in the Belizean press like those in The Reporter between 1973 and 1978 appearing under the title "Armchair Commentary.) In addition, teachers are often critical of children who come to class speaking broad Creole (Le Page 1972) or Spanish (Rubinstein 1979), and, perhaps unintentionally, tend to class these children as "slow" or "lazy." This classification often seems to carry with it the expectation that these children will lack ability, and this expectation is then "self-fulfilling" in many cases. This results in unnecessary failure in school, or school leaving, for many children.

Other writeres have noted that it may be undesirable to continue this language policy because of its implications for individual development.

Thus, Buhler and Hadel (1973, 1975) suggest that it is precisely because of the failure to teach English as a second language in Belizean schools that Belizean youngsters appear to be unable to keep apace of their British and American counterparts in the development of reading and writing skills. Like Young (1973:290), Buhler and Hadel suggest that the gap between children's school language and home language usage produces a "comprehension lag." Young points out that this lag might best be eliminated by teaching Creole children to recognize the rules underlying differences in English and Creole linguistic structure and use. Likewise, Buhler and Hadel (1973) suggest the use of textbooks which systematically review the structural features of English, Creole, and Carib, and which relate these features to each of the other languages.

Language and Education in Corozal Town

In order to explore the effects of the use of English as the instructional language in schools in Corozal Town on the intellectual and linguistic development of Spanish speaking children, I supplemented ethnographic research with the administration to children during the school term of two psychological and linguistic instruments. Before describing the sample, instruments, and the results of the study, it is important to say a few words about the relationship of language to education in Corozal Town.

The most recent sociolinguistic survey of Corozal Town (Koenig 1975) shows that for the majority of the town's population English is a second language. Indeed, only a little under five percent of those sampled indicated learning English as a first language, and three percent noted that this was at the same time as they acquired Spanish. Of those reporting other first languages, fifty-nine percent reported Spanish, and twenty-seven

percent reported Belize Creole as their first language (Koenig 1975:59-64). Additionally, the survey showed relatively little inter-group interaction among adults in Corozal Town. Fairly homogeneous language groups are able to form as a result (cf., Rubinstein 1979:587). Thus in a sample of 86 households of Spanish ethnic background fully eighty-six percent reported speaking only Spanish to their spouses. Likewise, eighty-nine percent of those households of Creole ethnic background reported using only Creole with their spouses (Koenig 1975:61-63). A similar situation was reported for inter-genrational communication; ninety-one percent of the individuals in the survey of parents of Spanish ethnic background reported speaking with their children exclusively in Spanish, while ninety-five percent of parents surveyed from the Creole ethnic group said they addressed their children only in Belize Creole.

This general split in the pattern of language use appears to be duplicated among children. Sociometric data I collected from children between the ages of 9 and 12, attending standards three through six of primary schools in Corozal Town, show that it is likely for children to pick other children whose first language is the same as their own for friends. Thus, Spanish children (N=110) picked other Spanish children as friends in sixty-nine percent of the cases, and Creole children (N=168) picked other Creole children as friends in seventy-five percent of the cases (Rubinstein 1979:587).

Despite the fact that most children in Corozal Town learn either Spanish or Creole as their first language, and in spite of the relative homogeneity of their early language experiences, they enter schools in which English is the principal medium of instruction. The teachers' pattern of language use in school make this situation particularly

difficult for Spanish speaking children, creating a sharp distinction between the linguistic world of school and that of the home. Thus, in answer to questions in a structured interview, only three percent of teachers in Corozal Town reported that they had any command of Spanish, and although seventy percent reported using Belize Creole, only two percent reported ever using Spanish in the classroom.

School children, then, bring with them to school a knowledge of, and experience with, a fairly narrow range of linguistic material. This is true for both Creole and Spanish children. Nevertheless, it is particularly the case that Spanish children entering school in Corozal Town find themselves in the strange and complex linguistic environment of an unstructured "total immersion" language experience. In class they find their teachers speaking English or Belize Creole, codes which are likely to be unfamiliar and confusing to children whose prior inter-generational communicative experiences, and continuing intra-generational interaction, have been overwhelmingly in Spanish.

Materials and Methods

A sample of Spanish speaking children (N=56) between the ages of 5 and 17, stratified by sex, was selected using a table of random numbers from a complete listing of all children attending primary and secondary schools in Corozal Town. This sample was then randomly divided into two subsamples; each of which was stratified by age and sex. Subsample 1 thus consisted of 28 children who were tested and interviewed in Spanish, while Subsample 2 consists of 28 children who were interviewed and tested in English.

Because education is compulsory at the primary school level, the sample may be considered to be quite representative of the general population of

Spanish primary school aged children.

The Measures

The general theoretical orientation of this study is cognitive-developmental, and, when dealing with the growth of nonverbal intelligence, the approach is explicitly Piagetian. This view sees intellectual development begining at a stage of undifferentiated globablity, and passing through an invariant sequence of progressivly more complex stages of thought, to the highly abstract, "formal operational"stage. Piaget has proposed that this progression in the growth of intelligence is a human universal. (The stages are ordered as follows: sensorimotor intelligence, preoperational thought, concrete operational thought, and finally formal operational thought. Flavell (1963) provides a critical summary of these stages and of the Piagetian system as a whole. Rubinstein (1979:591-592) discusses the applicability of this approach to the study of intellectual development in Corozal Town.)

The usefulness of this view for education, especially for curriculum development, is widely acknowledged (e.g., Ginsburg and Opper 1969). In fact, during my field stay, the Curriculum Development Unit of the Ministry of Education had undertaken to develop a primary level science curriculum based on Piagetian theory (see the Ministry's, Curriculum Bulletin No. 1, "Primary School Science: Principles and Techniques of Teaching," especially pp. 2-4).

The Feldman Colored Blocks Test of Basic Cognitive Level (CBT) was used to determine the complexity of a child's nonverbal intellecutal functioning, and the Semantic Strategy Test (SST) was used to determine the complexity of a child's organization of knowledge about the semantics of reference, and thus provides a measure of metalinguistic knowledge.

CBT

Introduced to the child as a "learning game," the CBT is designed to be as free as possible from dependence on verbal instructions. It is because

the test is designed so that the child receives a minimal amount of information concerning the correctness of his/her answers, and because differential reinforcement for correct and incorrect responses is disallowed by the administration procedure, that young children experience very low levels of frustration with the test.

Materials for the CBT include a set of 32 wood blocks (4 each, red squares, red circles, red triangles, red diamonds, yellow squares, yellow circles, yellow triangles, yellow diamonds) one set for the tester and one for the child, and a series of cards which the tester uses in combination with the blocks to generate problems for the child to answer with his/her blocks.

Administered with the tester and child seated side-by-side, the CBT proceeds through a series of sections designed to tap increasingly more complex and advanced levels of intellectual functioning (see, Figure 1).

Figure 1 about here

The test can be used to assess the basic abilities described by the Piagetian stages of the development of thought, although it also conforms to standard non-Piagetian psychometric measures in a reliable fashion (for greater detail about the CBT see Feldman et al. 1974, and Feldman and Stone 1978).

SST

The SST is an open-ended testing procedure used to assess the complexity of the strategies an individual uses to organize their knowledge about the nature of the semantic component of a language. Data from the test are scored into categories which represent strategies of increasing complexity.

Materials for the SST consist of a series of 64 watercolor pictures on a set of 3 inch by 5 inch cards.

In order to score the SST the child's strategies for grouping lexical items are placed into one of four categories: (1) global strategies, (2) concrete strategies, (3) functional strategies, and (4) abstract strategies. These may be illustrated by looking at one triad from the SST. Triad 5, which presents a picture of a bird's nest, a picture of a broom, and a picture of a house (see Figure 2), and asks the child group the two which go together best, and that he/she explain the grouping selected.

Figure 2 about here

A global strategy is of the following type:

Researcher: Which two go together best?

Child: None goes best.

R: Why not?

C. They are all equals, they are all the same.

This is the response of an individual who only makes rather broad, "global" distinctions between things in the environment.

A concrete strategy for Triad 5 might be like the following:

R: Which two go together best?

C: The broom and the nest,

R: Why?

C: Because they are both made of straw.

In this response, the distinctions used to organize the linguistic material rest on the physical, or concrete, characteristics of the items under consideration.

A functional strategy might be:

R: Which two go together best?

C: These two. The house and the broom.

R: Why is that?

C: The broom is used to sweep the house.

Here the items are grouped together because the child establishes a functional relationship between them.

Abstract strategies can be represented by the following sequence:

R: Which two go together best?

C: The nest and the house.

R: Why do the nest and the house go together?

C: Because they are both places to live, birds live in this and people live in this.

Here the reason for placing the two items together is clearly an abstract one— both places are domiciles. (Further information about the SST can be found in Rubinstein 1976, and 1979.)

Intellectual Functioning and Metalinguistic Awareness in First and Second Language

Both the subsample tested in Spanish (L_1) and the subsample tested in English (L_2) showed a strong positive relationship between age and level of nonverbal intellectual functioning (see Table 1). Further, the Piagetian

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Table 1 about here

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stages emerged in the expected order in each subsample. However, the shifts from one level of intellectual functioning to the next were more clearly observable and came slightly, though not significantly, earlier in the L_1 subsample than in the L_2 subsample. Further, the distribution of members of each of the subsamples over the various levels of intellectual functioning showed some non-significant variation (see Figure 3). In the L_1 subsample

thirty-two percent showed preoperational thought, thirty-nine percent showed concrete operational thought, and twenty-nine percent showed formal

Figure 3 about here

operational thought. In the L_2 subsample forty-six percent of the children showed preoperational thought, twenty-one percent showed concrete operational thought, and thirty-two percent showed formal operational thought.

The differences between the two subsamples were put to statistical test. Those tests revealed that none of the inter-subsample differences were statistically significant. Thus, it is legitimate to say that the two subsamples display the same patterns of nonverbal development. In other words, the language used to test for level of intellectual functioning as well as language of instruction in school does not adversely effect the growth of nonverbal intelligence among Spanish speaking children in Corozal Town, nor does processing the test materials in the L_2 provide children with any advantage over their L_1 counterparts.

The results of the SST are also quite clear cut. In both subsamples there is a strong relationship between the complexity of a child's semantic strategies, or their degree of metalinguistic awareness, and a child's level of nonverbal intellectual functioning. The relationship shown by the SST data from the L_2 subsample to the CBT data is, however, very different from that shown by the L_1 subsample. For the L_2 subsample, there is a strong association between preoperational thought and global strategies, concrete operational thought and concrete strategies, and between formal operational thought and functional and abstract strategies. But the L_1 subsample showed the earlier development

of higher degrees of metalinguistic awareness. Thus in the L_1 subsample

Table 2 about here

there is a clear relationship between preoperational thought and concrete strategies, concrete operational thought and functional strategies, and formal operational thought with abstract strategies (see Table 2). In relation to the growth of the understanding of the nature of language, testing Spanish speaking children in English, and presumably teaching these children in English, has serious consequences, consequences not expected on the basis of the "cognitive enhancement" view described earlier.

The Impact of English Language Instruction in Corozal

I have argued elsewhere that this data patterning may be accounted for by the notions of "environmental stress" and "systemic collapse" (Rubinstein 1979:595-597). Because the aim here is not simply the examination of the Belizean situation, but the extension of the additive—subtractive bilingualism distinction, I make here only a few brief observations about the implications of these data for the Belizean case.

In 1971 only sixty-one percent of those Belizean students who sat for the Cambridge General Certificate of Education "ordinary level" English examination were sucessful (Department of Education Annual Report 1970-1971). Although the exact figure is unavailable, there is little reason to believe that the percentage of students from Corozal Town who passed the exam is very much different (cf., Koenig 1975:110). By almost any measure these results are disappointing, and many Belizean educators were disheartened by them.

To the extent that the GCE English examination is geared to speakers of English as a first languge, it assumes a mastery of not only English grammar, but a well developed metalinguistic understanding of the pragmatics and

stylistics of English language use. Failure on the GCE English examination may, then, be more than a simple indication of a student's failure to master grammatical matters. Indeed, it may well indicate in a manner direct and frustrating for the student, that despite (or, in some cases, precisely because of) the student's mastery of prescriptive grammar he/she is not a fluent English speaker. In other words, failure on the GCE "O" level may indicate that the student lacks the degree of metalinguistic awareness about his/her second language that one would expect from a native speaker of the same age and intellectual abilities. (The data from the L_1 subsample of this study suggest that formal study of the student's first language may not be necessary for a degree of metalinguistic awareness to develop. And the rate of GCE Spanish "O" level exam successes in 1971 [some seventy-one percent] appears to support this notion.)

In light of the data presented above, and the preceeding discussion, if the rate of failures on the GCE English "O" level suggests anything to Belizean educators it suggests that the "unstructured immersion" situation of second language learning extant in Belizean schools should be replaced; perhaps by the reforms advocated by Young (1973) and Buhler and Hadel (1973,1975), that native speakers of Spanish, Creole, Carib, and Maya should be taught English as a second languge in Belizean schools, or that carefully structured immersion programs (like that described in Lambert and Tucker 1972) be established.

Nonetheless, results of the 1975 GCE English examination, which were less than hoped for, yielded a typical response from educators during my fieldstay; efforts to teach English grammar, and to a lesser extent literature, using the already current techniques were redoubled. All of the

pedagogical techniques employed assume that English is the students' first language. However well intentioned, then, these efforts were doomed to produce only minor increases in the rate of GCE passes, at best, and at worst to compound the frustrations of both students and teachers.

Briefly, the following aspects of the environment for English language learning appear to inhibit the growth of metalinguistic awareness. In the schools grammar lessons are given through mimicry and depend on memorization and rote learning. Reading lessons emphasize the mastery of proper pronounciation of words through repetition, and these lessons eschew attention to matters of style and to pragmatic aspects of English language use. Because the English of teachers is often creolized, and because students do not converse with one another in English during the school day when they are outside of class, they have little opportunity to practice and experiment with their knowledge of English. Such practice is a natural part of language learning, and probably contriubtes a great deal to the development of a child's metalinguistic understanding of language (see, Rubinstein 1979:584-586).

In general, Spanish serves as a symbolic marker of ethnic group membership. As a result, children report that their use of English among friends is negatively sanctioned. The English to which Spanish speaking children are exposed outside of school is often heavilly creolized, or consists of instances where English words or phrases are inserted into Spanish utterances. This seems to muddle the already limited exposure to English which these children received in school. Finally, the language of a child's preadolescent peer group, and the rules for language use in that peer group, have a strong effect on the language development of a child. Thus, the formation of linguistically homogeneous peer groups outside

of school may provide a strong inhibiting influence on the development of the metalinguistic awareness of English.

Subtractive Bilingualism Reconsidered

The remainder of this paper reexamines the notion of subtractive bilingualism and suggests directions in which research efforts designed to make the concept more useful might profitably be directed. Most of the directions noted below grow out of an examination of the Belize data presented above, but, where useful, the discussion draws freely on other studies as well. The theme which unites this discussion is that in order for the notion of subtractive bilingualism to become useful we need to differentiate more fully between different forms of "subtraction in bilingualism," and specify more precisely the antecedent conditions of each form.

Contrary to the pattern expected on the basis of the cognitive enhancement view described above, the Belize data present a situation in which the bilingual experience is socially subtractive and produces cognitive deficits (Rubinstein 1979:597). The learning of English by Spanish speaking children in Corozal Town is socially subtractive because of the milieu in which it occurs. Thus, in Corozal Town English is often taught with the intention that it replace students' first language (not that it supplement it), and this view is shared by many adults and children. This approach has several important implications; including interference with children's development of a sense of ethnic group identification, the inhibition of the growth of motivation and opportunity for second language learning, and the diminishing of the cohesion of social groups in Corozal Town in general. This result is anticipated by the cognitive enhancement view.

Whose proponents often note that because second language acquisition always occurs in a particular social setting, that the social setting may influence the type of social consequence produced by particular bilingual experiences (cf., Hornby 1977, Lambert 1974).

What is not expected on the cognitive enhancement view of bilingualism is that the social setting of the bilingual experience may have cognitive consequences. This is because bilingualism is seen as enriching a person's linguistic environment. And, this enrichment, in turn, is thought to set in motion processes which provide a cognitive or linguistic advantage for the bilingual (Genesee, Lambert, and Tucker 1975). Yet, this is precisely what appears to be happening in the Belizean data. I have argued at length elsewhere (Rubinstein 1979, 1976) that the link between the social level and the cognitive level results from the interface of systemic processes. Briefly, I noted that,

> When the environment exhibits greater complexity than an individual can optimally handle, we can speak of the environment as being noxious, stressful, or deficient in relation to the individual's cognitive development. Moreover, at the point where the environment becomes stressful for an individual, the integrity of their cognitive structures is endangered. This is because the system becomes functionally inoperative, its adaptive capability is reduced to a minimum, and its ability to cohere as a structural unit is threatened by external pressures (Rubinstein 1979:595-596).

It does not appear that a situation in which bilingualism creates an over-complex environment is unique to Corozal Town. In fact, although

descriptive material is not fully available, it appears that this same process occurs among young French-English bilinguals in Canada. Thus, Genesee, Tucker, and Lambert (1975) undertook to explore the impact of an environment linguistically enriched through second language learning on communicative skills of three groups of children in kindergarten through second grade (1. monolinguals, 2. partial immersion, and 3. total immersion language training). They hypothesized that,

> children participating in second-language instructional programs may develop greater differential sensitivity to the needs of others, especially those with a communication handicap, than do children in native-language school programs. Second, one might expect the development of differential sensitivity to correlate positively with the degree of exposure to or immersion in a second language (Genesee, Tucker, and Lambert 1975:1011).

In order to test this hypothesis they followed a procedure in which they taught children to play a simple game and then had each child explain the game to two listeners, one sighted and one blindfolded (the use of gestures was disallowed, as were questions from the listeners). These instructions were recorded and analyzed into three categories: information about 1. the game's rules, 2. the game's materials, and 3. extra information about the game.

They report that while there was no significant difference between the groups on the number of rules mentioned to each listener, that the partial and total language immersion groups gave fuller explanations in the "materials" and "extra information" categories, thus supporting their hypothesis.

Although both bilingual groups were acquiring their second language in supportive, structured environments, it is interesting to note that their data appear to show that the total immersion group may have been on the verge of experiencing the kind of over-complex environment noted for Corozal Town children. Thus a closer look at the summary of their data shows that in four of the six comparisons ("rules" and "extra")

TABLE 3 about here

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the total immersion group gave less information than the partial immersion group, and in the "extra information" category the total immersion group gave less information than even the monolinguals (see Table 3).

If, as I suspect, the Belizean situation is not unique, and the data presented by Genesee, Tucker and Lambert in fact reveal the operation of the same processes in incipient form among children learning their second language in a supportive environment, then it seems fair to question the general premise which underlies the cognitive enhancement view of bilingualism; that any enrichment of the linguistic environment is cognitively benificial. Once this premise is subject to reexamination the investigation of the consequences of bilingualism demands the detailed study of the social setting in which bilingualism is acquired, implicated cognitive processes, and the link between the two. Such study would serve to make subtractive bilingualism a meaningful and important concept in the study of bilingualism. The scope and general direction of this study, as I see it, is outlined in rough form below.

In order to establish the utility of the distinction between additive and subtractive bilingualism, it will be necessary to examine the interaction of at least (1) the structure and complexity of the language acquisition

environment, (2) an individual's cognitive functioning, (3) mastery of the second language, and (4) the age of second language acquisition.

The importance of the first two variables is apparent from the Belize study. The language learning environment (variable 1) may be so complex as to be noxious and cause a cognitive or linguistic deficit to develop. However, since the complexity of an environment is relative to an individual's level of cognitive functioning (Rubinstein 1979:595-597, and note that one third of the L_2 subsample in Corozal Town who were formal operational overcame the noxity of the language learning environment, and thus eliminated the deficit, see figure 4), it is important to know at what level an individual is functioning if we are to account for the consequences of their bilingual experience.

It is important, too, that we assess an individual's mastery of their second language (variable 3) in order to get an idea of whether the second language provides a well developed, supplementary system to support and elaborate thought, or simply serves to increase the complexity of a particular language environment by introducing "noise" into it. Further, it appears from studies of brain electrical activity in bilinguals (Genesee et al. 1978, Rogers et al. cited in Ten Houten 1976) that significant differences in language processing occur depending upon the age of second language acquisition.

Clearly each of these variables can be broken down still further, and finer distinctions drawn. Indeed, this will be essential. Thus, for example, the structure and complexity of the language learning environment might minimally include as subcategories (a) ethnolinguistic attitudes towards speakers of the second language, (b) formality of language learning situations, and their structure, and (c) the structure of childhood peer groups. And, the cognitive functioning variable would need to include investigations of (a) level of nonverbal cognitive functioning, (b) motivational studies,

and (c) cognitive style.

Nevertheless, even the broadly defined set of variables presents us with an imposing task. Considering only three of the variables, and assuming for simplicity that each has only a high and a low value (something that is plainly not the case) we are left with eight situations (see Table 4) which must be put to naturalistic test before

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Table 4 about here

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we can begin to account for the additive or subtractive nature of the bilingual experience.

Because it aruges for attention to the interaction between levels, the view of bilingualism presented here reopens for closer examination the view of the bilingual experience developed over the past two decades by Lambert and his associates. The value of the proposed reexamination lies in its promise to make more complete our understanding of the bilingual experience. Only when we can clearly specify what it means to say that we are observing instances of subtractive bilingualism, and why, will we be in a position to know how to make the bilingual experience both cognitively and socially "additive."

Notes

1. The data reported in this section of the paper were collected during ethnographic field research conducted between July 1975 and June 1976. The support of this research by the Research Foundation of the State University of New York, and the Department of Anthropology, State University of New York at Binghamton, is gratefully acknowledged.

MAP 1. Belize: Administrative Districts and Relation to the Central American Isthmus

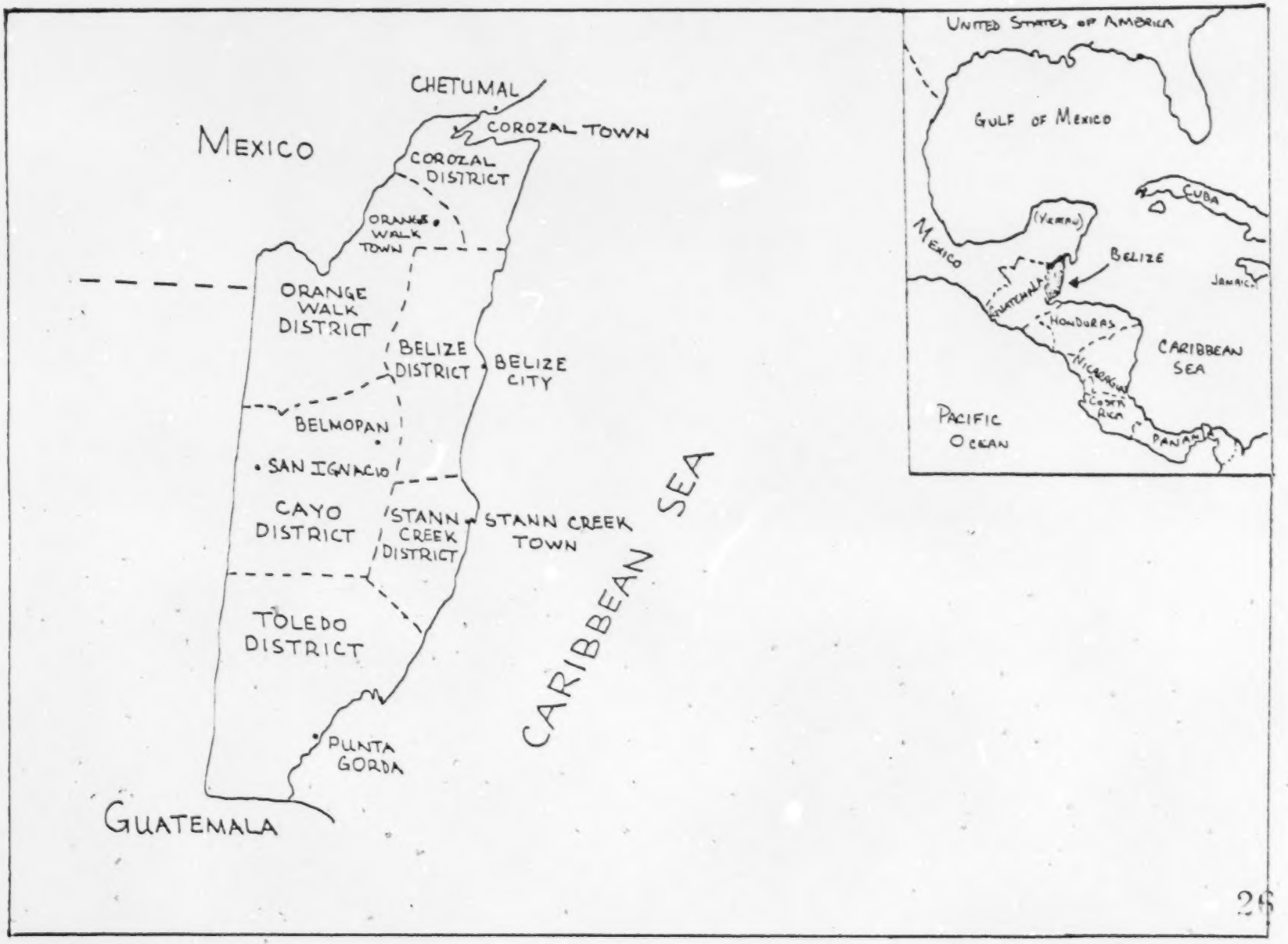

FIGURE 1. Representative Items from

Each Section of the Colored Blocks Test

(After, Feldman and Stone 1978)

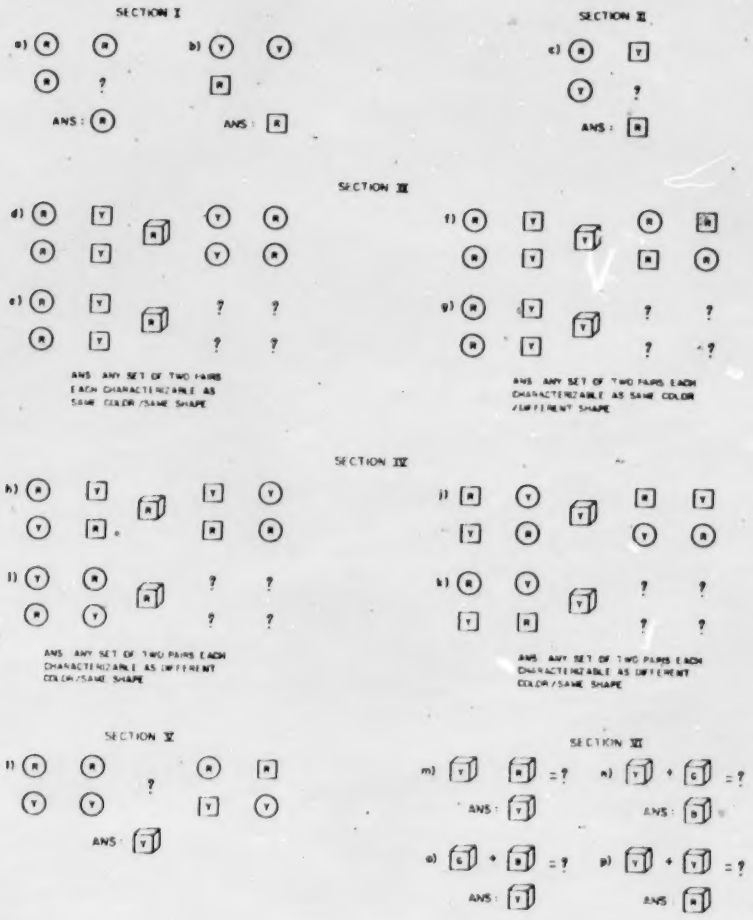
SECTION I
SECTION II
SECTION III
SECTION IV
SECTION V
SECTION VI
ANS: ANY SET OF TWO PAIRS EACH CHARACTERIZABLE AS SAME COLOR/SAME SHAPE
ANS: ANY SET OF TWO PAIRS EACH CHARACTERIZABLE AS SAME COLOR /DIFFERENT SHAPE
ANS: ANY SET OF TWO PAIRS EACH CHARACTERIZABLE AS DIFFERENT COLOR/SAME SHAPE
ANS: ANY SET OF TWO PAIRS EACH CHARACTERIZABLE AS DIFFERENT COLOR/SAME SHAPE

FIGURE 2. Triad 5 of the Semantic Strategies Test

56

58

57

FIGURE 3. Relative Distribution of Levels of Piagetian Operational Thought in L_1 and L_2

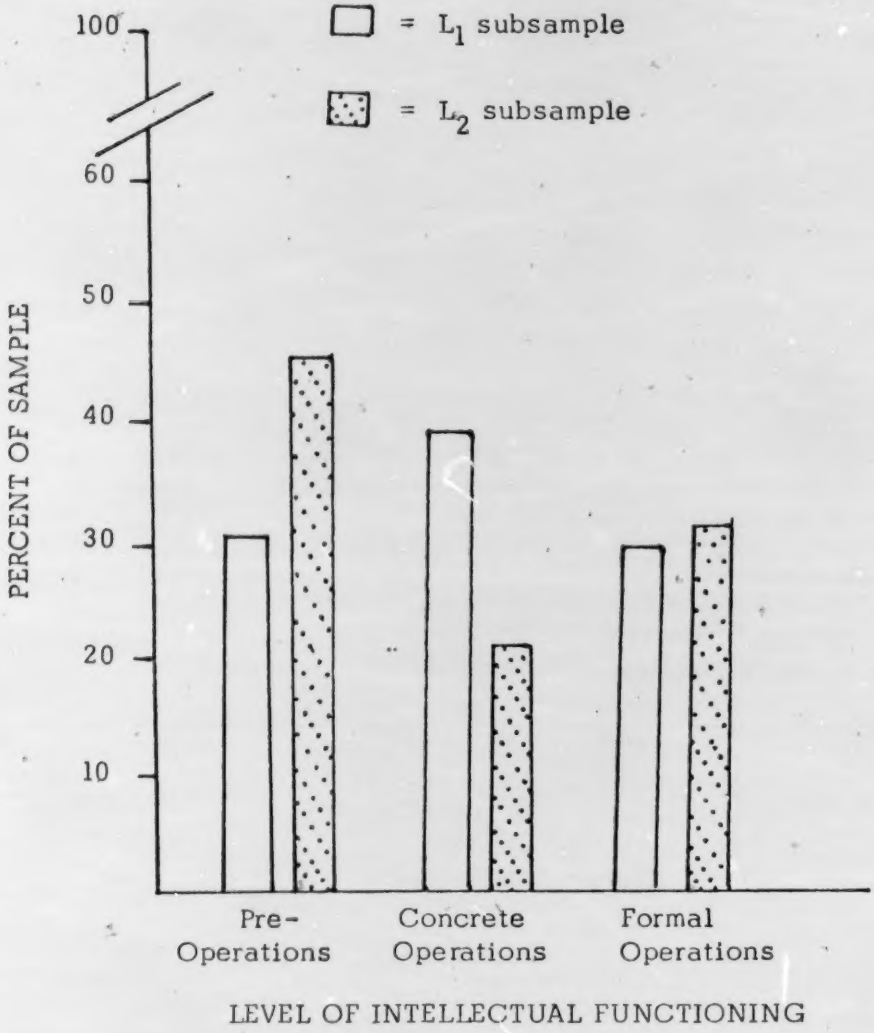

TABLE 1. Frequency of Success on Each Section of the Colored Blocks Test

	SAMPLE											
	Spanish/Spanish						Spanish/English					
	Section						Section					
AGE	n	A	1	2	3	4	n	A	1	2	3	4
5	2	2	-	-	-	-	2	2	-	-	-	-
6	2	2	-	-	-	-	2	2	-	-	-	-
7	2	2	2	1	-	-	2	2	2	-	-	-
8	2	2	2	-	-	-	2	2	2	-	-	-
9	2	2	2	-	-	-	3	3	3	-	-	-
10	3	3	3	3	-	-	3	3	3	1	-	-
11	2	2	1	2	-	-	2	2	1	2	-	-
12	2	2	2	2	1	-	2	2	1	2	-	-
13	3	3	3	3	2	-	2	2	2	2	1	-
14	2	2	2	2	1	-	2	2	2	1	1	1
15	2	2	2	2	1	-	2	2	2	2	2	-
16	2	2	2	1	2	-	2	2	2	1	2	-
17	2	2	2	1	1	-	2	2	2	2	2	-
	28	28	23	17	8	-	28	28	22	13	8	1

TABLE 2. Relationship of Semantic Strategy to Level of Nonverbal Cognitive Development in L_1 and L_2 Subsamples

Level of nonverbal cognitive development	L_1 Subsample				L_2 Subsample			
	Semantic Strategy				Semantic Strategy			
	Global	Concrete	Functional	Abstract	Global	Concrete	Functional	Abstract
Preoperational	-	9	-	-	12	1	-	-
Concrete Operational	-	-	11	-	-	5	-	-
Formal Operational	-	-	1	7	-	-	6	3
	N= 28 r= .960 p< .001				N= 27 r= .914 p< .001			

TABLE 3. Communicative Skills of Bilingual Children (After Genesee, Tucker, and Lambert 1975)

	Rules		Materials		Extra	
Language Group	Sighted	Blind-folded	Sighted	Blind-folded	Sighted	Blind-folded
Control	3.82	3.75	0.21	0.75	1.17	1.42
Partial Immersion	4.06	4.25	0.29	1.08	1.53	1.39
Total Immersion	3.99	4.15	0.32	1.53	0.95	0.96
Total	3.96	4.05	0.27	1.12	1.22	1.25

TABLE 4. Some Examples of the Possible Interation of Variables in the Study of Subtractive Bilingualism

	Expected Outcomes
Optimal Environment	
High cognitive ability + High L_2 mastery =	Additive/Neutral
High cognitive ability + Low L_2 mastery =	Neutral/Subtractive
Low cognitive ability + Low L_2 mastery =	Neutral/Additive
Low cognitive ability + High L_2 mastery =	*
Suboptimal Environment	
High cognitive ability + High L_2 mastery =	Additive/Neutral
High cognitive ability + Low L_2 mastery =	Neutral
Low cognitive ability + Low L_2 mastery =	Neutral/Additive
Low cognitive ability + High L_2 mastery +	*

* A theoretically impossible condition, since language ability should not be able to exceed nonverbal ability.

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